WASHINGTON
SCIENCE TRENDS

HIGHLIGHTS

- PROPULSION TRENDS
- R & D TRENDS
- INVENTIONS WANTED
- WHEELCHAIR COMPETITION
- RESEARCH CHECKLIST
- PUBLICATION CHECKLIST

Vol IV No. 11 May 30, 1960

PROPULSION TRENDS

Here is a summary of some recent developments in Government programs:

* Atomic Airplane: The Pentagon has slated another in a seemingly endless series of reviews of the always-controversial Aircraft Nuclear Propulsion (ANP) program, with the expectation of a decision by September 1. ANP survived a $75 million budget cut threat in the House of Representatives during the past week and the Senate is expected to vote to continue the program. The Pentagon review may choose between the indirect cycle approach being developed by Pratt & Whitney, or the direct cycle project of General Electric. Or it may decide to continue both. Meanwhile, the GE program has switched from metal to ceramic elements for its reactor design and increased attention is being given to the complex "plumbing" problems of the indirect cycle. The new goal for both programs envisions a one-thousand hour reactor life for an airplane that will fly up to 35,000 feet and which may have supersonic capabilities. Both GE and Pratt and Whitney, and the Air Force are reported to be convinced that the B-70 bomber can be adapted for nuclear propulsion.

* Project Pluto: Atomic Energy Commission and Air Force officials have beaten back surprise attempts to cancel or reduce this program for a nuclear-powered ramjet missile designed for long-time, low-altitude missions. Pluto is being examined for technical feasibility only at this time, they stated, and there is not yet a formal military requirement. However, Congress has been told that operation at altitudes of 1,000 feet is possible and that "there is no known adequate defense against high speed, low-altitude missiles." One report in the hands of Congress, from a source not identified, agrees to the need for a "low-flying terrain-controlled delivery vehicle" but suggests chemical propulsion would best fit this need.

* Hydrofoils: Private industry is urged to enter the race for development of hydrofoil craft, particularly for antisubmarine warfare applications. Admiral R. K. James, Chief of the Navy's Bureau of Ships complains that it is "high time" that private shipping interests start to participate in developing hydrofoils, at least for short haul commercial service. He also points out that the aircraft industry can contribute greatly through its knowledge of light-weight frames, engines and structural members, airfoil research and similar areas. In fact, airframe as well as shipbuilding organizations have been invited to compete on the sole hydrofoil ship construction program in the Navy. Those with waterfront facilities are invited to compete directly, while those without such facilities are being urged to enter the competition on a joint-venture basis with shipbuilders. Research is still required on hull and machinery weights, strengthening of foil structural members, increased propulsion efficiency and particularly on supercavitating foils, a comparatively new field. Ground effect machines, which ride on a cushion of air, should also be of greater interest to private industry, according to Adm. James. He said the Navy envisions important applications for this type of craft.

R & D TRENDS

* Ballistic Missile Defense System: Army Rocket and Guided Missile Agency is asking industry to submit proposals for a successor to the cancelled "Plato" system for field defense against enemy ballistic missiles. The ARGMA, located at Redstone Arsenal, Ala. has been distributing technical requirement packets through Army Ordnance District Offices to interested contractors. The desired system would have greater mobility, would be effective against a wider variety of targets and would incorporate advances in the state of the art. Proposals are to be submitted late in June, after which they will be evaluated, and contractors selected to conduct feasibility studies.

* Institutional Grants: The National Science Foundation will soon announce that it is setting up a special office to handle grants to non-profit educational institutions on an "institution-wide" basis. The program is designed to supplement existing project grants, and to encourage colleges and universities to set up programs and laboratories which cut across the traditional lines of study and research.

* Government ADP Programs: "Middle management" employees in federal agencies will be eligible to participate in the first Government-wide orientation and intern programs in automatic data processing (ADP) to begin in September. The training courses, which underscore the growing role of data processing in Government, will deal primarily with the uses and implications of ADP in management, rather than on technical knowledge.

* Aircraft Company Backlog: Census Bureau studies show that the aircraft industry maintained its status quo during the first quarter of 1960. The value of backlog for complete aircraft, aircraft engines and propellers came to more than $12.2 billion -- up one percent in three months. The military services account for 69 percent of the aircraft backlog, 74 percent of the engines backlog and 86 percent of the propeller backlog.

  (For further details write Publications Office, Bureau of the Census, Washington 25, D. C. for Current Industrial Report Series M37D(60)-1) Two Pages. 10 cents)

* Air Force Research: The recently organized Air Force Research Division (AFRD) will include two major organizations which have been assigned to the Air Force Cambridge Research Center, L. G. Hanscom Field, Bedford, Mass. Involved in the shift are the Electronics Research Directorate and the Geophysics Research Directorate. Both will remain at Hanscom but will report to AFRD Headquarters in Washington.

* Toxics Research: The Advanced Research Projects Agency of the Department of Defense has taken over toxicological research responsibilities of the military services -- specifically excluding chemical warfare agents. The $500,000 program will be coordinated by the Army Chemical Center Laboratories and will study new chemical products which may be hazardous under certain working conditions. This may include such items as new propellants, fuels, coating, solvents, lubricants, explosives and the like. The military services are still free to carry on their own programs in this field, if they have specific enviromental and occupational health hazards. An example cited is the case of the Army, which might use a certain lubricant in a tank or other enclosed space while another service may require its use only in an open area, where there would be no hazards involved.

INVENTIONS WANTED

Here is the first in a series of new reports on Inventions Wanted by the military services or various Government agencies.

Subscribers interested in any of these research tasks may write Service Department, Washington Science Trends, 1120 National Press Bldg., Washington 4, D. C. You will be furnished with the problem number, and information on how and where to submit proposals.

( ) NON-CORROSIVE BEARING: The critical problem of lubrication for the military services would be greatly reduced if bearings of corrosion-resistant steel were available with a load-rating equal to bearing steel. Keep in mind that bearings for automotive tanks, as an example, may range in size from miniature designs for instruments to as large as 100 inches in diameter in special ball races for turret traversing. Maximum speed ranges from about 10,000 rpm for the smaller sizes to about 5 rpm for the largest. However, corrosion resistance improvements would be in metals for general bearing use, rather than for one particular application. No general requirement for chemical resistance applies.

( ) HELICOPTER RANGE FINDER: The requirement here is for a range finder on a helicopter capable of accurately ranging with high resolution plus or minus five miles in azimuth and elevation at ranges to 3000 miles. The device should be capable of operating under all weather conditions. It should weigh in the order of 25 pounds, and should be rugged, reliable and simple to operate.

( ) IMPROVED OSCILLATING OR TRANSMITTING TUBES: The need exists for a reduction in the size and weight of radar tracking beacons so that they can be adapted for widespread use in rockets, missiles and space vehicles. The largest components in the most recent models are the duplexer and mixer assemblies. The Government would be interested in seeing your suggestions on how these could be made smaller.

( ) PLASTIC BATTERY CASE: This development is required for the cases and manifolds of automatically activated missile batteries. A Government agency is seeking a plastic material which can be injection molded as a multiple cavity item but will not deform when subjected to temperature stabilization at 212°F. In addition, the material must not deform or craze down to -80°F and must be capable of being cemented by simple procedures.

( ) LAMINAR FLOW AIRCRAFT SURFACE: This problem centers on the need for extremely smooth surfaces for application on wings and bodies of low-drag aircraft employing suction boundary layer control. You might accomplish this through either a new material or a bonded veneer covering. But the material used must be capable of retaining its smoothness qualities during service operations.

( ) HIGH TEMPERATURE BONDING MATERIAL: The Government specifies that this material must be capable of bonding thermoelectric materials at high temperatures up to 1000°C, be dimensionally and thermally stable and have low electrical resistance and high thermal conductivity. It must not diffuse into the thermoelectric material or form a high resistance junction with it at these elevated temperatures. In addition, it must be capable of withstanding thermal shock from -40°C to 1000°C.

* A $5000 Challenge --- Invent a Better Wheelchair

You can win $5000 in prize money in a special competition sponsored by two civilian arms of the U. S. Government with funds supplied by a "public-spirited citizen."

Objective of the contest is the design of a "revolutionary" wheelchair which would make it easier for a physically handicapped person to move around in an industrial building. Solution of the problem, it is believed, would simplify employment problems for the handicapped.

The Chair must meet the following requirements:

- ø Approximate weight -- 50 to 75 pounds
- ø Maximum weight of occupant -- 200 pounds
- ø Should be capable of being folded by user and stowed inside an auto.
- ø Should be capable of negotiating any stairs with average height risers and variable depth of tread, as found in office buildings and homes. Should be able to turn on any stair landing large enough for the wheel chair to maneuver.
- ø It is preferable that the occupant should be able to ascend the stairs without assistance. As an alternative, an attendant could assist and thus permit the chair to be tilted backwards and steadied by the attendant. In this position, the chair and occupant should be in a reasonable balance so that no more than 15 to 25 pounds weight will be transferred to the attendant.
- ø In descent, the wheel chair can be backed down if it is not feasible to descend with the occupant facing down the stairs. Other variations, as described previously for ascent may apply here also.
- ø The chair should be self-propelled. Operation of the drive mechanism by either the occupant or an attendant should be possible. Effective arm strength of the occupant will be a minimum of 10 pounds. Speed of ascent or descent is not a critical factor, but should be reasonable.
- ø Retail cost of production models of the proposed wheel chair should be no more than $500. Current models of self-propelled tubular frame, folding wheel chairs are priced at about $150 retail and $80 wholesale.

Send proposals to the National Inventors Council, Washington 25, D. C., a U. S. Government agency. Judges have been selected by The President's Committee on Employment of the Physically Handicapped. Decisions are final but if substantially identical workable proposals are selected the prize money will be equally divided. If no single concept satisfies the requirements lesser prizes may be granted for features that may be combined into a workable design.

(Submission of ideas does not transfer title in them to the Government. Prize winners are expected not to use any proprietary rights to delay or impede commercial introduction of the device.)

RESEARCH CHECKLIST

( ) ATTENUATION METER: A distance measuring device developed for the U. S. Army is expected to be of value to Arctic explorers and scientists in determining their exact location under severe atmospheric handicaps. The snowy wastes of the Arctic often produce optical illusions distorting the size and shape of objects, making it impossible to visually gauge distances with accuracy. The attenuation meter uses two highly sensitive photoelectric circuits. One measures the light from a distant horizon while the other measures the brightness of the air path between it and a black spot. Both values are registered on a meter and from these the distance at which the same black spot could not be seen by the eye can be calculated.

(Research and Development by The Scripps Institute, University of California)

( ) SPACE OXYGEN SYSTEM: The Air Force is contracting for the design, development and manufacture of a liquid oxygen converter system to operate at zero gravity. The system is to be applied to breathing apparatus for individual space travelers. The project is said to include unique features of capacity gauging, thermal insulation and single-phase delivery from a two-phase storage vessel.

(Research and Development by AiResearch Manufacturing Division, the Garrett Corp., Los Angeles, Calif. for Wright Air Development Division, U.S.A.F.)

( ) SPACE COMMUNICATIONS: The Federal Communications Commission has called for initial reports by March 1, 1961 as to frequency requirements for space communications on a longer range basis. The information is expected to be used in preparatory work leading to a U. S. position for future international conferences on space communications needs.

( ) MISSILE BEACON: More precise study of missiles launched at night is said to be feasible with an airborne optical beacon with a precisely timed light flash rated at a peak of 50 million lumens. The controlled flashes will be photographed from the ground and provide a series of dots on a photographic plate for a record of the missile's trajectory. Transistorized circuitry makes it possible to step up a nominal 28 volts of direct current from a series of silver cells to 4000 volts. This buildup is said to be necessary to light a specially designed quartz tube filled with Xenon gas, and with an electrode sealed into each end.

(Research and Development by Battelle Memorial Institute for the Grimes Manufacturing Co., Urbana, Ohio)

( ) IMPROVED SOLID LUBRICANT: The use of various inorganic sulfide additives is said to have made possible the development of a solid lubricant with as much as 20 times the load-carrying capacity of conventional solids. The use of solid lubricants is said to make possible the miniaturization of many devices since they can be used at higher temperatures, with improved reliability and reduced maintenance. The new lubricant was achieved by the addition of various inorganic sulfides to the well-known lubricant molybdenum disulfide, or to tungsten disulfide. Among the most effective sulfides are those of antimony, platinum, mercury, silver, titanium and lead.

(Research and Development by A. J. Haltner, Curtis S. Oliver, General Electric Research Laboratory, Schenectady, N. Y.)

PUBLICATION CHECKLIST

( ) RADIATION PROTECTION STANDARDS, a new publication containing much original material on this problem, including related areas such as fallout, radioactive waste disposal, X-ray exposures and other sources of radiation. Includes a detailed account of the activities of various Federal and State agencies. 1200 Pages, Single Copies Free. (Write Joint Committee on Atomic Energy, F-88, The Capitol, Washington 25, D.C. for Selected Materials on Radiation Protection Criteria)

( ) NASA BIOSCIENCES, the complete transcript of a press briefing on NASA plans for establishment of a Life Sciences Program. 20 Pages. Single copies free. (Write Information Office, National Aeronautics and Space Administration, 1520 H Street, N. W., Washington 25, D. C. for Press Briefing -- NASA's Role in the Life Sciences)

( ) JOINING OF BERYLLIUM, a review and evaluation by the Defense Metals Information Center of information on the joining of Beryllium. Dated March, 1959 and now available. 28 Pages. 50 cents. (Write OTS, U. S. Department of Commerce, Washington 25, D. C. for DMIC Memo 13)

( ) MACHINING OF BERYLLIUM, a discussion by the Defense Materials Information Center of safe, effective methods of machining of Beryllium. Dated June, 1959 and now available. 16 Pages. 50 Cents (Write OTS, U. S. Department of Commerce, Washington 25, D. C. for DMIC Memo 21)

( ) HEAT CONTENT DATA, a U. S. Bureau of Mines study on high-temperature heat content, heat capacity and entropy data for the elements and inorganic compounds. The information is provided in tabular form for those who make thermodynamic computations by means of tables, and in algebraic form for those who prefer equations. 232 Pages. $1.25. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Pub. I 28.3:584)

( ) MILITARY CONSTRUCTION, complete testimony, statements and exhibits on Army and Navy plans for construction projects during the next fiscal year. 668 Pages. Single Copies Free while available. (Write Committee on Appropriations, U. S. House of Representatives, Washington 25, D. C. for Hearings, Military Construction F.Y. 1961 -- Part I)

( ) ABC WARFARE DEFENSE, a Navy training course now available designed to provide information for enlisted personnel before, during and after an Atomic, Biological or Chemical attack. 161 Pages. $1.25 (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication D 208.11:W 23)

( ) ENGINEERING TRANSFERS, a Government study of transfers to schools or colleges of Engineering for the years 1951, 1952, 1953 and 1959. 7 Pages. Single Copies Free. (Write Publications Inquiry Unit, U. S. Office of Education, Washington 25, D. C. for Pub. OE - 54005)

( ) SPACE PHYSICS, another in an excellent series of Reports in Progress by the Space Science Board of the National Academy of Sciences. This work covers interplanetary gas and magnetic fields, energetic particles in space, the radiation belts and similar topics. 58 Pages. $1 (Write Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, N. W., Washington 25, D. C. for Science in Space, Chapter VII)